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**Patentanmeldung Nr. Patent application No. Demande de brevet n°**

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Koninklijke Philips Electronics N.V.  
Groenewoudseweg 1  
5621 BA Eindhoven  
PAYS-BAS

Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:  
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Image data display on an information carrier

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**FIELD OF THE INVENTION**

The invention relates to an information carrier intended to be put in a rotation motion.

5 The invention also relates to a player apparatus for playing such an information carrier.

The invention may be used in the field of optical disc for displaying a still image on a optical disc in a player apparatus.

**10 BACKGROUND OF THE INVENTION**

Information carriers such as optical discs comprise visual data mapped on the surface opposite to the reading surface. In particular, visual data may correspond to the label of the record or the table of content (TOC). These data are only visible by a user when the disc is not rotating.

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The Japanese Patent published under number 11-250644 describes a disc player comprising means which allow to see the label of a disc when rotating. To this end, the player comprises means for flashing a label face once per revolution so that the label can be seen as an apparently still image by making the afterimage continuous. The property of the human eyes  
20 to integrate visual information is used.

The disc player as described in the prior art document has technical limitations.

25 The use of flashing means takes up a lot a space in the player, so that this solution cannot be used in consumer products such as disc players of reduced size.

Moreover, flashing means are power consuming.

Finally, using flashing means only allows to see an image that was previously printed on the disc.

**30 OBJECT AND SUMMARY OF THE INVENTION**

It is an object of the invention to propose an information carrier allowing to display an apparently still image when rotating.

To this end, the information carrier comprises :

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- display means dedicated to display image data, said display means being located by a spatial position,
- processing means for periodically sending to said display means, image data having the same spatial position as said display means.

The periodic sending of image data allows to obtain a continuous afterimage so that the displayed image is apparently still for user looking at the disc player. This invention is based on the property of the human eyes to integrate visual information is used, but compared to the prior art, means for obtaining an apparently still image are directly put on the disc itself. Thus, such a solution no more needs flashing means, which allows to reduce the size of a player apparatus intended to play an information carrier according to the invention.

In a preferred embodiment, the information carrier comprises a memory device for storing said image data.

This memory device allows to store image data concerning the information carrier, such as for example the disc label, the TOC, or an image of the performer.

In a preferred embodiment, the information carrier comprises contact-less means for receiving said image data from an information carrier player apparatus.

This feature allows to personalize and to change the content of the displayed image on the disc. For example, a CD audio information carrier may receive coloured patterns changing according to the music, or any image data (or a sequence of image data) sent by the player apparatus.

In a preferred embodiment, the information carrier comprises calculation means for calculating the angular position of said display means, and/or contact-less means for receiving said angular position from an information carrier player apparatus.

The absolute spatial position of the display means is located by its angular position.

If the calculation means for calculating the angular position are implemented in the information carrier, the data exchange with the player apparatus are limited, which allows to decrease the complexity of such an apparatus and eases the use of information carriers according to the invention in existing player apparatus.

If the calculation means for calculating the angular position are implemented in the player apparatus, the cost of information carriers according to the invention is reduced.

In a preferred embodiment, the display means of the information carrier are arranged along a radial direction of the information carrier.

Considering that the information carrier has a rotation motion, this arrangement of the display means is advantageous since a plurality of pixel can be displayed at the same time.

In a preferred embodiment, the display means of the information carrier correspond to a polymer LED display or to a LCD display.

This type of display allows to reproduce the content of the image data while ensuring an easy addressing, and/or a thin thickness of the information carrier. If these displays correspond to LCD displays, the power consumption is reduced significantly.

The invention also relates to an information carrier player apparatus comprising contact-less means for sending image data to an information carrier as previously described.

In a preferred embodiment, the player apparatus comprises calculation means for calculating the angular position of said display means, and contact-less means for sending said angular position to the information carrier previously described.

Detailed explanations and other aspects of the invention will be given below.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

The particular aspects of the invention will now be explained with reference to the embodiments described hereinafter and considered in connection with the accompanying drawings, in which identical parts or sub-steps are designated in the same manner :

Fig.1 depicts an information carrier according to the invention at different time interval,

Fig.2 depicts the processing means implemented in an information carrier according to the invention, and processing means implemented in the player apparatus according to the invention in which the information carrier is intended to be inserted,

Fig.3 depicts an image to be displayed on an information carrier according to the invention.

#### **DETAILED DESCRIPTION OF THE INVENTION**

Fig.1 depicts the structure of an information carrier 101 according to the invention, said information carrier being intended to be put in a rotation motion. This information carrier corresponds for example to a CD Audio, a DVD, or any other optical disc. This information is shown at different time interval.

The information carrier 101 comprises display means 102 for displaying digital image data. The display means 102, interdependent with the information carrier 101, are mapped on a surface of the information carrier 101 so that the reading operation performed by a laser beam is not disturbed. The display means 102 are spatially located by a spatial position, in particular by the angle  $\phi$  between the horizontal axis (x) and the axis (z) of the displays means. Axis (x)

and (y) form reference axis. In this embodiment, display means 102 comprise only six elementary display areas to ease the understanding of the invention, but displays having a higher number of elementary pixel areas could be used. Each elementary pixel display is located with a radius value  $r_i$ .

5           The information carrier 101 comprises processing means for periodically sending to the display means, during the rotation of the information carrier at an angular speed  $\omega$  rad/s, image data having the same spatial position as said display means. Such processing means are preferably implemented in a integrated circuit 103 placed at a position where the normal read/write operations of the disc are not disturbed. Advantageously, the integrated circuit is  
10           placed close to the central hole of the information carrier in order to avoid mechanical unbalance. When placed between the clamping area and the information area where the reflective mirror of the disc can be leave out, the position of the chip can be detected optically.

          Let suppose that the circular image 301 as depicted in Fig.3 to be displayed on display means 102. This image 301 is composed of a plurality of image data (i.e. pixels) advantageous  
15           located in the image plan with polar coordinates.

          At a period equal to  $\Delta T$  ( $\Delta T = \Delta\Phi/\omega$ ), image data of image IMA having the same spatial position (i.e. same angle and same radius  $r_i$  in the image plan) as the spatial position  $\phi$  of the display means, are displayed. For example, at time  $T_0$  pixels (P1, P2, P3, P4, P5, P6) are displayed on the display means 102, at time ( $T_0 + \Delta T$ ) pixels (P7, P8, P9, P10, P11, P12) are  
20           displayed on the display means 102, at time ( $T_0 + 2.\Delta T$ ) pixels (P13, P14, P15, P16, P17, P18) are displayed on the display means 102, etc ... This successive display of image data being performed at a very small time interval  $\Delta T$ , a continuous afterimage is created.

          The display means 102 correspond to a LED display (light-emitting diode) having the  
25           characteristic to be thin, flexible, and of small mass. Such a display is arranged according to a rectangular pattern placed on the information carrier according to a radial direction (z), as shown in Fig.1.

          The display means 102 correspond to a LED display (light-emitting diode) having the characteristic to be thin, flexible, and of small mass. In particular, the display corresponds  
30           advantageously to Polymer LED display known as PolyLED display. A reflective Liquid Crystal Display (LCD) being thin and of small mass can also be used, but must be illuminated externally.

          Fig.2 depicts the processing means implemented in an information carrier 201 according to the invention, and processing means implemented in the player apparatus 202 in  
35           which the information carrier 201 is intended to be inserted and played.

          The information carrier 201 and the player apparatus 202 communicate by means of contact-less means 203 and 204. Contact-less means 203 are implemented in the player

apparatus, while contact-less means 204 are implemented in the integrated circuit 205 (referred to as 103 in Fig.1) and/or at its periphery. Different technological approaches can be used for implementing such contact-less means :

- inductive approach : using alternating magnetic flux at a few MHz (typically 13.56 MHz) sent by a coil implemented in the player apparatus, and received by a coil implemented in the information carrier,
- capacitive approach : using an alternating electrical flux of high voltages, and antenna plates in both the information carrier and the player apparatus,
- RF (radio frequency) approach : using Electro Magnetic radiation at high frequencies (a few GHz), with an antenna in the player apparatus, with or without an antenna implemented in the information carrier,
- optical coupling approach.

The integrated circuit 205 comprises a memory device 206 for storing the image data to be displayed on the display 207. The image data can be initially stored by the publisher of the information carrier (ROM memory may be advantageously used in this case), or received in real-time by contact-less receiving means 203-204 from the player apparatus (RAM memory may be advantageously used in this case), or programmed in non-volatile memory (EEPROM, MRAM) by the user. Image data can either be stored using polar coordinates, or Cartesian (processing means being needed in this case to get polar coordinates). Image data can be either in a raw format (such as bitmap), or alternatively in a coded format (such as JPEG format). In this last case, the information carrier comprises decoding means (not represented) for decoding such coded image data.

Image data may correspond for example to patterns whose colours are changing according to the music played, or any other information intended to be looked at by a user (text, images, graphics, sequence of images, updated TOC or movies).

The absolute angular position  $\phi$  of the information carrier 201 can be determined by calculation means 208 comprised in the chip 205, or alternatively determined by calculation means 209 comprised in the player apparatus. In this last case, the angular position  $\phi$  is sent to the information carrier by contact-less means 203-204 from the player apparatus. Different technological approaches can be used for determining the absolute angular position  $\phi$  :

- optical detection of the position of the display 207 via the disc-read-out spot (optical marker at read-side of the information carrier),
- from the wobble addresses of the information carrier,
- optical detection of the position of the display 207 via extra detection means (optical or magnetic means used as a proximity detector) in the player,

- using the rotation motor tacho intended to put the information carrier in a rotation motion,
- using a one Pulse Per Rotation signal (1PPO) obtained by the display or integrated circuit e.g. by on-chip detection by an integrated photo diode of a stationary light spot.

5

The processing means 210 are applied to image data stored in memory 206. They correspond in particular to code instructions of a software program executed by a signal processor embedded in the chip 205. The processing means 210 receive absolute angular position  $\phi$  for identifying which pixels of the image must be sent to the display, as well as a clock signal CLK indicating at which frequency  $f$  these pixels have to be identified ( $f = 1/\Delta T$ ).

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At a given time, the pixels identified by processing means 210 are sent to a display driver 211 in charge of driving the display 207 (addressing operation, data buffering ...).

The power supply VCC of all processing and display means implemented in the information carrier 201 is supplied by contact-less means 203-204 or by an on-disc battery.

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**CLAIMS**

1. Information carrier intended to be put in a rotation motion, said information carrier comprising :
  - display means dedicated to display image data, said display means being located by a spatial position,
  - processing means for periodically sending to said display means, image data having the same spatial position as said display means.
2. Information carrier as claimed in claim 1 comprising a memory device for storing said image data.
3. Information carrier as claimed in claim 2 comprising contact-less means for receiving said image data from an information carrier player apparatus.
4. Information carrier as claimed in claim 3 comprising calculation means for calculating the angular position of said display means, and/or contact-less means for receiving said angular position from an information carrier player apparatus.
5. Information carrier as claimed according to one of claims 1 to 4 where display means are arranged along a radial direction of the information carrier.
6. Information carrier as claimed according to one of claims 1 to 5 where display means correspond to a polymer LED display or to a LCD display.
7. Player apparatus for playing an information carrier, said player apparatus comprising contact-less means for sending image data to an information carrier as claimed in claim 1.
8. Player apparatus as claimed in claim 6 comprising calculation means for calculating the angular position of said display means, and contact-less means for sending said angular position to said information carrier.

**"Image data display on an information carrier"****ABSTRACT**

5 The invention relates to an information carrier 101 intended to be put in a rotation motion, said information carrier comprising :

- display means 102 dedicated to display image data, said display means being located by a spatial position,
- processing means for periodically sending to said display means, image data having the same spatial position as said display means.

10

Use : Optical disc / Optical disc player

Ref : Fig.1

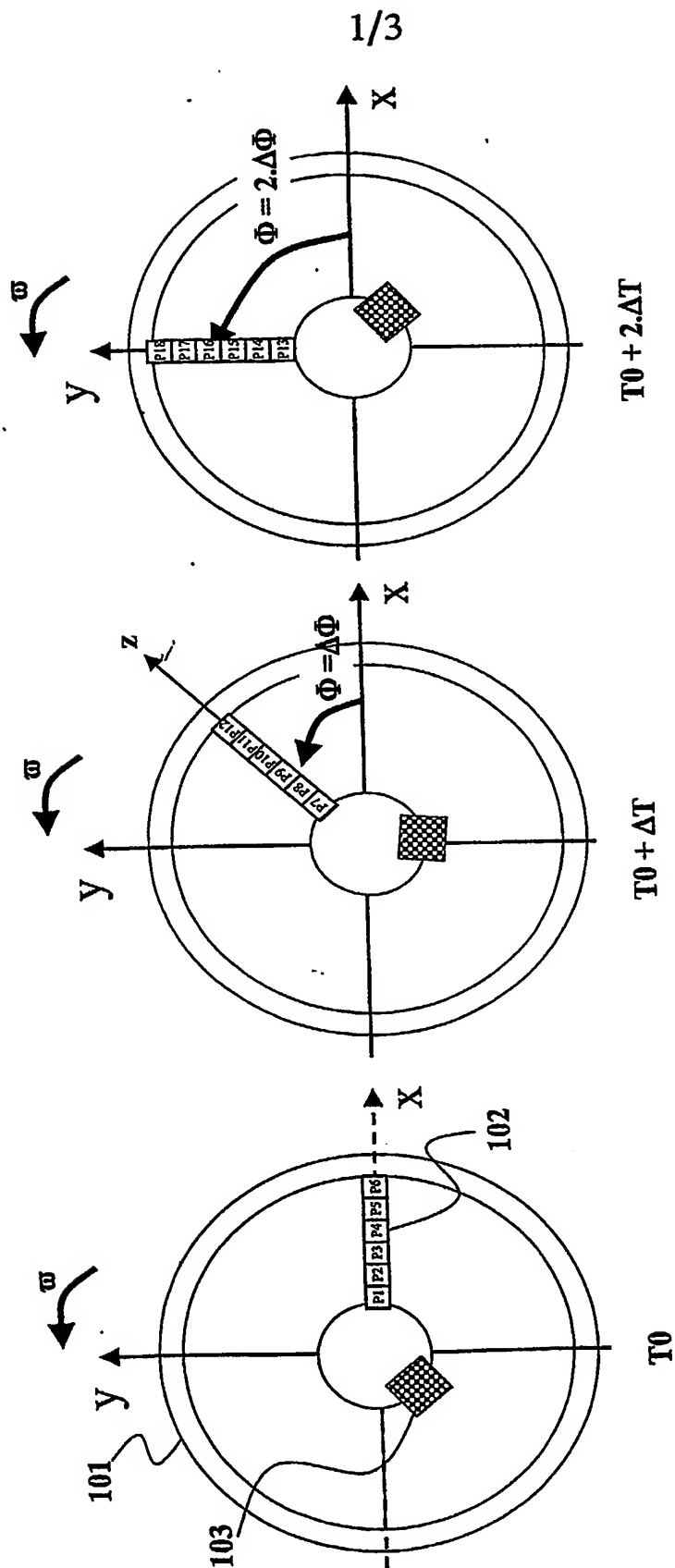


FIG.1

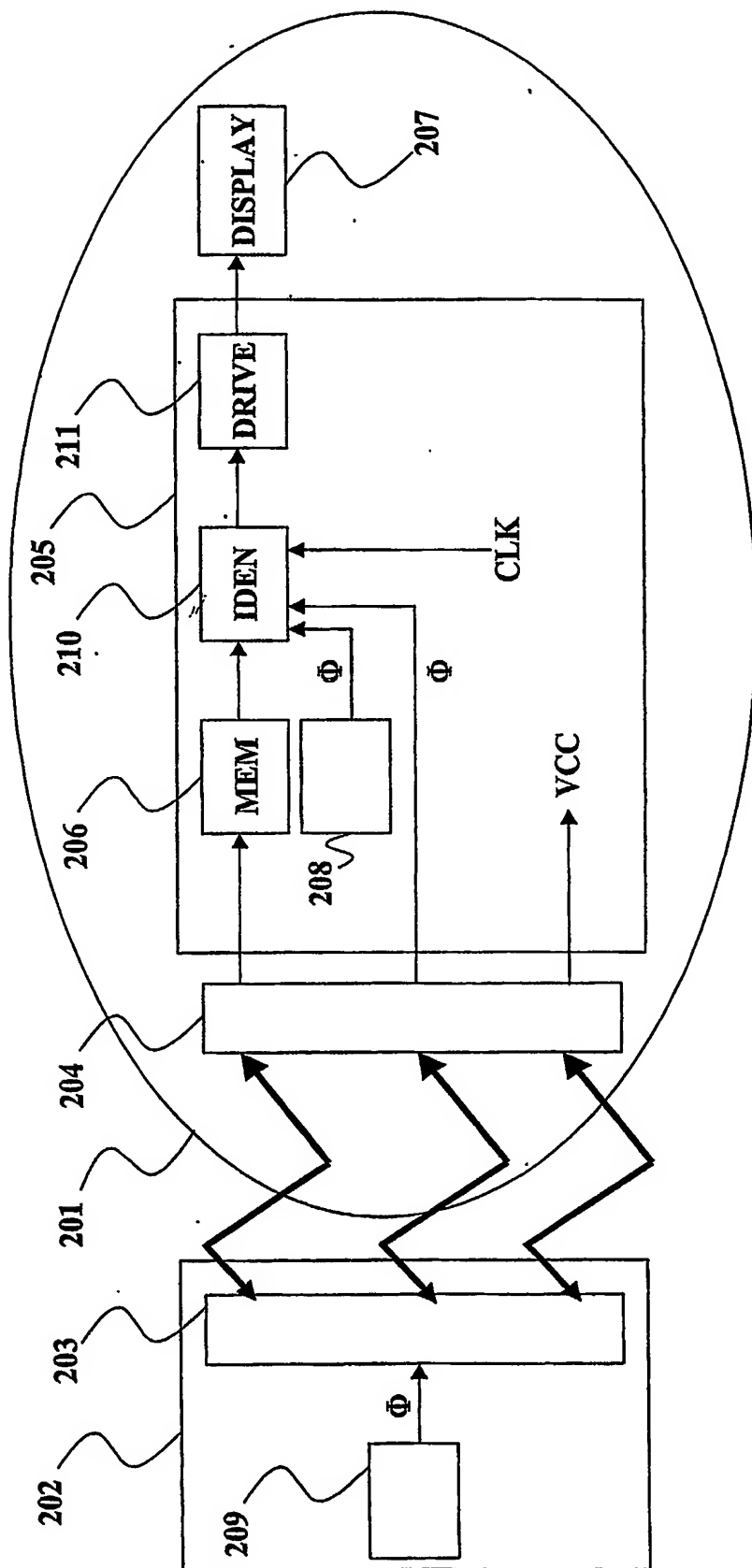
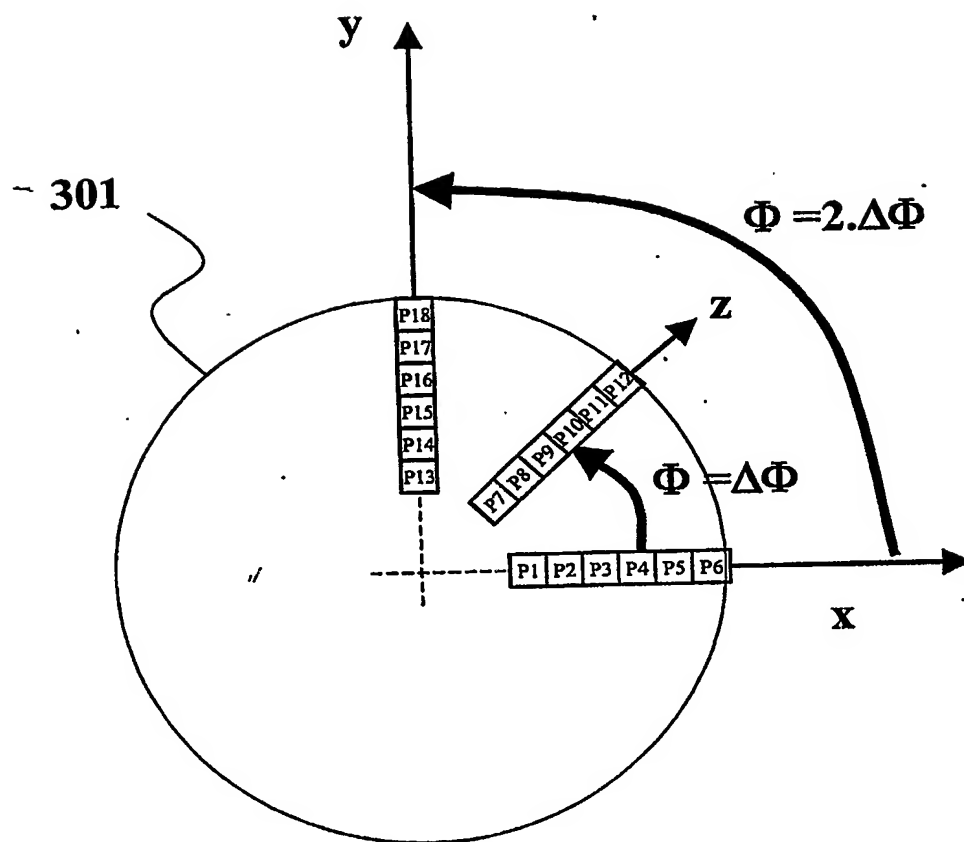


FIG. 2

**FIG.3**

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